

Claims

1. An apparatus for compensation for aberrations or distortions of an optical system, comprising:
 - 5 means for directing a beam of light through the optical system;
 - detector means for detecting the beam of light after the beam of light has passed through the optical system; and
 - 10 processing means for receiving data from the detector and for processing the data to produce phase data relating to the wavefront of the beam of light emanating from the optical system to enable a transformation to be determined for transforming the data relating to the
 - 15 detected wavefront to a predetermined reference, and for applying the transformation to an image which has passed through the optical system to remove aberrations or distortions introduced by the optical system.
- 20 2. The apparatus of claim 1 wherein the detector comprises a charge coupled device.
3. The apparatus of claim 1 wherein the apparatus includes a light source for shining a parallel beam of
25 light through the optical system and a beam splitter for directing reflected light from an article travelling back through the optical system to the detector for detection.
4. The apparatus of claim 1 wherein the apparatus
30 includes a lens for focusing light passing through the optical system so as to obtain an image of an article viewed through the optical system.
5. The apparatus of claim 1 wherein the data to
35 which the transformation is applied is intensity data.
6. The apparatus of claim 5 wherein the application

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of the transformation comprises a deconvolution of the intensity data.

7. The apparatus of claim 1 wherein the
5 transformation is a propagation of the wave from one image location to another.

8. A method for compensating for aberrations or
distortions in an optical system, comprising the steps of:
10 shining light through the optical system;
detecting the light after the light has passed
through the optical system;
producing phase data relating to the wavefront of
light detected by the detector;
15 determining a transformation to transform the
phase data in accordance with a known reference data; and
applying the transformation to data relating to
an image of an article produced through the optical system
so as to remove the effects of aberrations or distortions
20 of the optical system on that data.

9. The method of claim 8 wherein the data to which
the transformation is applied is data relating to the
image of the object so that the image of the object is
25 produced free of distortions which would otherwise be
introduced by the distortions or aberrations in the lens
system.

10. The method of claim 8 wherein the detector
30 comprises a charge coupled device.

11. The method of claim 8 wherein the data relating
to the image is captured by directing a beam of light
through apparatus including a lens for focusing light
35 passing through the optical system so as to obtain an
image of an article viewed through the optical system.

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12. A fundus camera for producing an image of the fundus of a person's eye, said camera comprising:

5 a detector for detecting a beam of light passing through the cornea and lens of a person's eye and reflected from the fundus of the person's eye and again passing through the lens and cornea of the person's eye;

10 processing means for determining phase data relating to the wavefront of the light beam detected by the detector and for producing a transformation required to convert the phase data from that detected by the detector to a known reference data;

15 the detector also being for detecting a beam of light directed through a person's eye to obtain an image of the fundus and for producing phase data relating to that image; and

20 the processing means being for processing the phase data relating to the image in accordance with the transformation to transform the data relating to the image to compensate for aberrations and distortions introduced by the cornea and lens of the person's eye, and for producing a image of the fundus, which is therefore free of distortions and aberrations introduced by the cornea and lens of the person's eye.

25 13. The camera of claim 12 wherein the camera also includes a light source for producing the beams of light detecting by the detector.

30 14. The camera of claim 12 wherein the camera further includes a lens for focusing the beam of light towards the eye so that the beam of light which produces the image is reflected from the fundus so as to provide an image of the fundus.

35 15. The camera of claim 12 wherein the camera has a monitor for displaying a image of the fundus.

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16. Apparatus for determining the amount of distortion or aberration of a lens system, comprising:
 means for directing a beam of light through the optical system;
5 detector means for detecting the beam of light after the beam of light has passed through the optical system; and
 processing means for receiving data from the detector and for processing the data to produce phase data
10 relating to the wavefront of the beam of light emanating from the optical system and for determining the amount of aberration or distortion of the lens system relative to reference phase data.
- 15 17. A method for determining aberrations or distortions in an optical system, comprising the steps of:
 shining light through the optical system;
 detecting the light after the light has passed through the optical system;
20 producing phase data relating to the wavefront of light detected by the detector; and
 comparing the phase data with a reference phase data to determine the difference and therefore the aberration or distortions introduced by the lens system.

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